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Abstract: Today, the president of the United States is an engineer; one hundred and forty-one years ago saw the inauguration of another engineer, George Washington, the first president, and "Father of Our Country." Since he possessed such diversified accomplishments it is only natural for us to overlook his more humble occupation of an engineer in favor of the romantic and heroic role of soldier and statesman. Even so, he was essentially an engineer, being a planner, a builder, and a visualizer of the future needs of his country. It was the keen analytical mind of the engineer that enabled him to conquer an army that was thought invincible. Not only do we have accounts of his military feats, but we also have material evidence of his engineering ability in his surveys of various natures, the ruins of the Potomac Canal, his pet project, and in the beautiful and well-planned city of Washington, the nation's capital.

WASHINGTON, THE ENGINEER

By ELDON G. CONSTANCE, CER. E. 1

Today, the president of the United States is an engineer; one hundred and forty-one years ago saw the inauguration of another engineer, George Washington, the first president, and "Father of Our Country." Since he possessed such diversified accomplishments it is only natural for us to overlook his more humble occupation of an engineer in favor of the romantic and heroic rôle of soldier and statesman. Even so, he was essentially an engineer, being a planner, a builder, and a visualizer of the future needs of his country. It was the keen analytical mind of the engineer that enabled him to conquer an army that was thought invincible. Not only do we have accounts of his military feats, but we also have material evidence of his engineering ability in his surveys of various natures, the ruins of the Potomac Canal, his pet project, and in the beautiful and well-planned city of Washington, the nation's capital.

Washington began his engineering career at the age of fourteen when he learned the rudiments of surveying. He immediately put his knowledge to use by surveying his brother's and adjoining neighbor's lands. He made a drawing of his "Survey of Mount Vernon Hills," the original of which is in possession of the Department of State. Even in this crude drawing are seen the elements of the embryo engineer. It was due to this training that Washington received his first real task.

Washington's first commission in an engineering capacity was appointment as assistant surveyor of an expedition into the Shenandoah wilderness to survey the vast lands of Lord Fairfax. The sixteen-year-old engineer earned the sum of about three and one-half dollars per day at this arduous task. Washington's data and experiences recorded in his "field book" diary are very interesting. The problems he met and adventures he had served to further develop him into the man we know. He must have encountered conditions encountered by any engineering expedition into uncivilized lands, because he describes in his "field book" such things as the discomfort of sleep under "one thread Bear blanket with double its Weight of Vermin such as lice, fleas, etc." The instruments used in those days were very poor, but owing to the cheapness of land (as low as ten cents an acre) errors of one or two per cent were considered negligible. Nevertheless, recent surveys over the ground covered by Washington's expedition show amazing accuracy on the part of this boy engineer. This valuable training led to still more tasks in his chosen profession of engineering.

After his return, he obtained, by the aid of Lord Fairfax in 1749, the position of public surveyor for Fairfax County. The surveys of Washington for the next two years carried him far into the interior, increasing his knowledge of woodcraft, Indian warfare, and engineering. His aroused interest in these western lands was never abated from then on till his death but, owing to deaths in the family, this interest was pushed somewhat in the background.

At the age of twenty, he became executor of the estate of his half brother's daughter, himself coming into possession at her death ten years later. For quite a number of years we find Washington's life one of mixed military activities and plantation management. Except for his feats of military engineering, Washington, the engineer, was inactive. However, in the services of Virginia he rose to the rank of colonel, due to his deeds in the French and Indian War and with Braddock. But we find him returning to his old love of engineering again through his interest in the development of the West.

In 1774, Washington was at the head of the Virginia Land Company, a strong rival of the Transylvania Company headed by Colonel Archibald Henderson. Both companies were interested in opening the western country. As the result of Washington's survey parties, he conceived the idea of linking the East and West by means of a canal following the Potomac and Ohio rivers, uniting their almost joined headwaters. While on one of these surveying parties, a man by the name of Rumsey conceived the idea of propelling boats by means of mechanical power. Washington, quick to see the engineering possibilities in such an invention, encouraged him. Later, Rumsey constructed a sixty-foot model, steam propelled, upon which Washington commented with true engineering discernment as to its value for saving man power, time, and money. He also noted the ease of accessibility of the machinery for repair and operation. As this boat (being propelled by a system of poles pushing against the bottom), was adapted for shallow inland waters, Washington intended using them in the dreamed-of canal. Impending war and meetings of Congress cut short his activities at that time.

At a meeting of Congress in Philadeplhia, in 1774, Patrick Henry, who was connected with the Virginia Company, upon being asked who was the greatest man in Congress, replied, "If you speak of eloquence, Mr. Rutledge, of South Carolina, is by far the greatest orator; but if you speak of solid information and sound judgment, Colonel Washington is unquestionably the greatest man on the floor." How true to the character of an engineer—not eloquent, but sound judgment and solid information! It was this faculty that led the ragged revolutionists to victory. During the war he had occasion to encourage another inventor, Bushnell, who proposed to build a submarine for use in naval warfare.

The close of the war found the personal affairs of Washington in poor condition except for enough worthless Continentals to paper Mount Vernon. For three years he was busily engaged rearranging his business affairs. In 1784, Washington made another trip into the West to survey his purchased lands, remove squatters, and lastly to complete plans for the Potomac Canal. With previous data and additional facts gathered on this trip, he came back and enthusiastically began interesting prominent men in his scheme.

In 1785, the approval of Washington's plans for opening navigation of western waters was accomplished, when Maryland and Virginia passed a law authorizing the foundation of the "Potowmack Company," and asked Pennsylvania to improve the waters of any of her streams which might be used to connect the Potomac and Ohio Rivers. Washington, the engineer, eager to see his plans realized, wasted no time in acting.

February 8, 1785, the books of the Potowmack Company were opened, and in May 403 shares had been sold, totaling a capital of $200,000. George Washington was duly elected President, or "Chief Engineer." Chief Engineer Washington realized that other people's money was involved and sensed the necessity of making sure of success. This is shown by the information he exacted from his associates. Solutions to problems were submitted to him on cost of labor; saving of money of water route over highway; comparison of different routes, their obstacles and cost of surmounting them; cost of different types of locks, everything that would insure success was passed in analytical review. It would be a boon to the gullible public if modern enterprises were as careful. The work was finally started with Washington constantly in the background hovering over the materialization of his dream. Other states, their jealousy aroused, began looking at their own inland water route possibilities. As the result of this spirit of competition, Washington's Potomac project became the center of canal engineering of the country with every move and new idea readily gobbled up by representatives of New York and Pennsylvania. After a part of the canal around Great Falls, which lies ten miles north of Washington, was completed, the money gave out and the work was discontinued. Washington tried to secure additional funds, but a war-stripped country is a poor sympathizer with an enterprise which had alread sunk a seemingly enormous sum and it was not until 1828 that the Chesapeake and Ohio Canal, which had incorporated the route planned and started by Washington was opened. So, Washington's dream at last was realized, and though he did not live to see its completion, it is nevertheless a monument to his ability. Washington was then swept into a still greater enterprise by the politics of a nation struggling to right itself.

In 1789, Washington was unanimously elected President of the new nation. At that time Congress was using Philadelphia as the capital city. For a long time the different states competed for the distinction of having the National Capital. Both Congress and Washington realized the need of a federal city wherein to transact the nation's business. Finally Congress settled the dispute by passing a law for the selection of a site ten miles square along the Potomac River and giving to President Washington full power to select the site, survey, and plan it. Thus, we find Washington back in his old rôle of engineer. Washington's frequent rides from Mt. Vernon had been a means for him to become familiar with that territory. He, together with Jefferson and Madison, made extensive investigations into many possible sites. Washington from the first was impressed with the Georgetown site, because of its advantageous commercial possibilities, the navigability of the stream and harbor, and the possibilities of defense owing to its commanding hills.

For surveying and planning a city, Washington selected two of his aides during the war, Major Ellicott and Major L'Enfant, both excellent engineers. Major Ellicott surveyed the selected site, his marks, stone shafts standing three feet high, were placed every mile. The shafts still stand preserved by chapters of the Daughters of the American Revolution. Major L'Enfant, in the meantime, was enthusiastically preparing the plans of what he was going to make the most beautiful city in the world. Later, L'Enfant, caused Washington much worry by withholding the plans from the engraver. Washington, patience exhausted, had Ellicott draw plans from the rough drawings possessed by Washington, aided by information supplied by Jefferson. L'Enfant was very angry, stating that the plans were altered.

Elizabeth S. Kite in her book "L'Enfant and Washington" gives good reasons, together with letters, for L'Enfant's withholding his original plans. The City of Washington was first laid out after the Ellicott drawings. In 1902, Congress resolved that L'Enfant's plan should be reverted to, and changes that would carry out his original plan were as far as possible made. In the city itself, Washington and Jefferson, looking into the future, caused building regulations to be made, which allowed only brick buildings.

Thus, we have George Washington, the engineer, a true example of the accepted definition of an engineer, in that he spent a great deal of his time in "the art and science of organizing and directing men and of controlling the forces and materials of nature for the benefit of the human race."

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